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and his forced residence among the Tekke Turcomans, reads like a romance and is full of interesting facts respecting this "Queen of the World," which still contains 500,000 inhabitants. Here are the extensive ruins of Giaur Kala, the original site of Merv, destroyed by the Arabs about the end of the seventh century, and those of Bairam Ali, its successor, destroyed in 1784 by the Amir of Bokhara.

The travels of General Macgregor in Beloochistan (1876–1877) proved that the Mashkid and Mashkel rivers do not flow into the sea or into the Helmand, but after their confluence in the romantic pass of Tank Zorati flow mainly north-west to the Mashkel Hamun, a marsh with no outlet.

CAPELLO AND IVENS' TRAVELS IN CENTRAL AND WEST AFRICA.—The narrative of Messrs. Capello and Ivens, who left Benguela in Nov., 1877, in company with Major Serpa Pinto, and afterwards parted from him and explored the Cuango northward to about 5° S. lat., has been published.

The sources of the Cunene, Cuanza and Cuango were visited and determined, and considerable information obtained respecting the region. The country is mountainous, cut up by numerous streams, and in many parts rich in vegetation. The habits, dwellings, implements, weapons, etc., of these villagers are pretty much the same as those of other Bantü tribes which figure in the narratives of Pinto, Stanley, Cameron and others.

The Bihenos are the greatest native travelers in Africa, and Bihé is rich and fertile. Elaborate methods of dressing the hair prevail.

The sources of the Cuango were found at a height of 4756 feet, at about 11½° S. lat., and a little east of 19° E. long. Near this point arise an infinity of spring-heads, the sources of affluents of the Tchipaca, Cuango, Cassai, Lume and Loando, flowing towards the Congo-Zaire, Cuanza and Zambesi. The region around this remarkable watershed is rich in iron and copper, and produces a wealth of vegetable products.

The Cuango was followed to about 140 miles of the point where it discharges into the Congo, and was abandoned on account of the intense aridity of the country. The course of the river is obstructed by rocks, rapids and cataracts, so that it is unnavigable.

From the historical details given it is evident that for centuries the various African peoples have been in a state of constant migration.

GEOLOGY AND PALÆONTOLOGY.

NEW ORDERS OF CRINOIDEA.—In the second edition of his American Palæzoic fossils Mr. S. A. Miller characterizes three new orders and four new families of Crinoidea, with the following definitions:

Order Agelacrinoidea and family Agelacrinidæ. Body thin, circular, parasitic; its lower side a thin, smooth membrane or plate of attachment; its upper side more or less convex, and composed of thin squamiform or imbricating plates, usually smallest at the periphery. Ambulacra, a double series of transverse alternating plates, with smaller ones sometimes intercalated. Two or more rows of ambulacral pores. The ovarian or anal aperature in one of the inter-ambulacral areas. The genera are Agelacrinus, Edrioaster and Hemicystites.

Order Lichenocrinoidea and family Lichenocrinidæ. Body attached during part or all of its life, circular, convex above, more or less crateriform around the stem. A thin, attaching plate on the lower side at some period of life. Upper side covered with polygonal plates, without traces of ambulacra, arms, mouth, pectinated rhombs or pores. Interior of visceral cavity with numerous radiating upright lamellæ supporting the polygonal lamellæ above. Stalk composed at its origin of interlocking plates, afterwards of circular ones, ending in a point, flexible and perforated longitudinally.

Order Myelodactyloidea. Body free, discoidal and possessed of an internal radiating system of pores, which increase by division, from the center to a tubular channel in the circular margin or surrounding cell.

This order contains the families Myelodactylidæ and Cyclocystoidæ, in the first of which the radiating and circular systems become complicated by the connection between succeeding coils through the flattened connecting finger-like processes; while in the latter the arrangement is more simple, as the interior radiations connect with a single marginal circular system.

Myelodactylus is a coil in one plane, the whorls connected by finger-like processes, and each whorl is composed of a series of plates, having a tubular channel within.

Cyclostoides has a circular marginal series of plates, with a tubular channel, connected with the interior by numerous pores that radiate from the center. In both these genera, the only known types of their families, the structure is so different from that usual in the Crinoidea, that the terms calyx, ambulacra, arms, etc., cannot be applied.

Cyclostoides is from the Hudson River group, Myelodactylus from the Niagara, and Lichenocrinus from the Hudson River and Utica slate.

THE GEOLOGY OF SOUTHERN AFRICA.—The following is a somewhat condensed quotation of the lately published narrative of Messrs. Capello and Ivens:

"The physical configuration of Africa, south of the Equator, may be thus summed up: A depressed central basin, surrounded by a vast circle of high land, gradually descending to the sea, and rent by deep ravines, through which rush huge water courses, engendered in the interior, till they overflow and seek the lower level fronting the ocean. From a very general geological point of view we may define the regions running from the littoral to the interior in the following order, viz., limestone, sandstone and granite. These distinctions are not very exact on a closer view, the component parts run into each other and change places, while precise lines of demarcation are wanting. The west coast at the points observed by us between Loanda and Mossamedes, and even further to the north, shows a belt of tertiary deposits near the sea, with abundant masses of sulphate of lime and sandstone, from which they are separated by beds of white chalk alternating with primary rocks, mostly gneiss, abounding in quartz, mica, hornblende, granite and granulated porphyry. Towards the south large tracts of feldspar are visible. At Mossamedes whole mountains are composed of sulphate of lime, while carbonate of lime (in shells) is frequent. Rock-salt and nitrate of potash occur stratified. We were told that a basaltic line of great length exists along the Moscambe chain. From that point commence true *saharas* of shifting soil, abundant in sand, as in the parallel of Tiger bay. In the transition from the lower zone to the interior, as at Dondo, the soil of vast tracts is composed of schist, in perfect laminæ, and sandstone, red with oxide of iron, is visible in every direction. In the mountains further in the interior the ground is composed of granite-quartzy rock, extremely hard and compact; this is the case throughout the belt up to Pungo N'Dongo, the surface soil being formed by disintegrated granite.

These geological characters will naturally be repeated north and south in identical parallel regions, with variations in the high table-land, where we meet occasionally with hard and tough red sandstone and rocks of feldspar, as in the basin of the Lucalla."

REMARKABLE LAND-SLIPS.—A late number of *Knowledge* contains a remarkable account of two land-slips. The first of these occurred near Fort de l'Ecluse, at Mt. Credo, on the Rhone. The *Times*' Geneva correspondent says: "The condition of things is serious. The entire side of Mont Credo, on which the forts are built, appears to be giving way, and more earth-slips are feared. The lower fort is considered past saving, and the garrison has been withdrawn. The rocks on which the fort stand are said to be undermined. If they should fall into the Rhone, which is exceedingly narrow thereabouts, the course of the river will be completely blocked, and the entire valley, for over twenty miles, joined to the lake. This is another evidence, on the large scale, of the great levelling action which is going on continually all over the world, the ever-active tendency on the part of mountain masses to get to a low level, having plenty to work upon in Switzerland."

A correspondent of the *Dublin Express* writes as follows respecting a "Moving Bog." The incessant rain produced immense floods in the neighborhood of Castlerea. A bog moved a considerable distance, causing serious losses to the adjoining farms.

About midway between Castlerea and Bellinagare—a distance of six miles—there is a gently sloping vale abounding in rich meadow and pasture lands. The road is somewhat higher than the fields. Along this valley the bog forced its way. On reaching the road it was held in check for a time, but eventually bursting across and rushing with amazing rapidity, it covered in its course over 120 acres of fine "pasture" lands. All communication between Castlerea and Bellinagare (by this route) is cut off, huge masses of bog coating lie on the road ten feet deep. The bog commenced a half mile from the road. The bog has showed signs of moving for many years back. The cause is attributed to defective drainage. It started suddenly, reaching the road over half a mile distant in ten minutes. The fields are now covered with twenty-six feet of bog. It has now forced its way into the river Suck, which flows through this town.

INTERMITTENT WELLS IN NEBRASKA.—In looking over the April NATURALIST I was glad to see the facts concerning these wells so authoritatively stated. A few years ago, while examining the geology of that region, I learned something concerning them, but did not have time to investigate them as I wished. I now have no doubt of the facts and little concerning their explanation.

The region is table land slightly sloping toward the south-east, away from the Platte river, which flows along its northern margin. Its geological structure is quite uniformly, as follows:

Surface soil	2–3 feet.
A yellowish clayey soil (typical loess)	30–40 "
Ancient soil	2–5 "
A reddish, coarser loess-like clay	40–45 "
Sand, with some gravel	40–60 "

The underlying rock is unknown, but probably belongs to the Niobrara group. It is not unlikely that Bowlder clay underlies the sand considerably, for it is well developed a little east of David city, and judging from the depth of wells I infer that its surface slopes gradually toward the west, nearly to Shelby, if not beyond.

The belief of the farmers of the region, "that the water-level in these wells corresponds to the level of the Platte river, I do not hesitate to say, is correct. I was once quite skeptical about it, but careful examination of scores of cases in Polk, York, Adams and Kearney counties have fully convinced me of the existence of a vast subterranean lake, as it were, in this great sand deposit. The surface of this lake must not be conceived as a true level, because its southern side is drained by the numerous streams which head in these counties and flow southward, the Platte descends rapidly eastward, but such variations are not very apparent. In a *very* few cases permanent water is found in wells above this level, where we may suppose a local basin-shaped deposit of clay.

This subterranean circulation of water was first announced by

Professor S. Aughey, of Lincoln, and more particularly of the region further west, between the Platte and Republican (*vide* Physical Geography and Geology of Nebraska, p. 59, also U. S. Geological Report for 1874).

As to the cause of the rise and fall of the water in the wells of the region, we may conclude that it is primarily due to a varying pressure of the atmosphere. This may be inferred from its observed connection with the direction of the winds. Southerly winds usually attend a low barometer and winds from the north bring high barometer. Hence we interpret the observations under consideration, as showing that the water in the wells rises when the barometer falls, and *vice versa.*

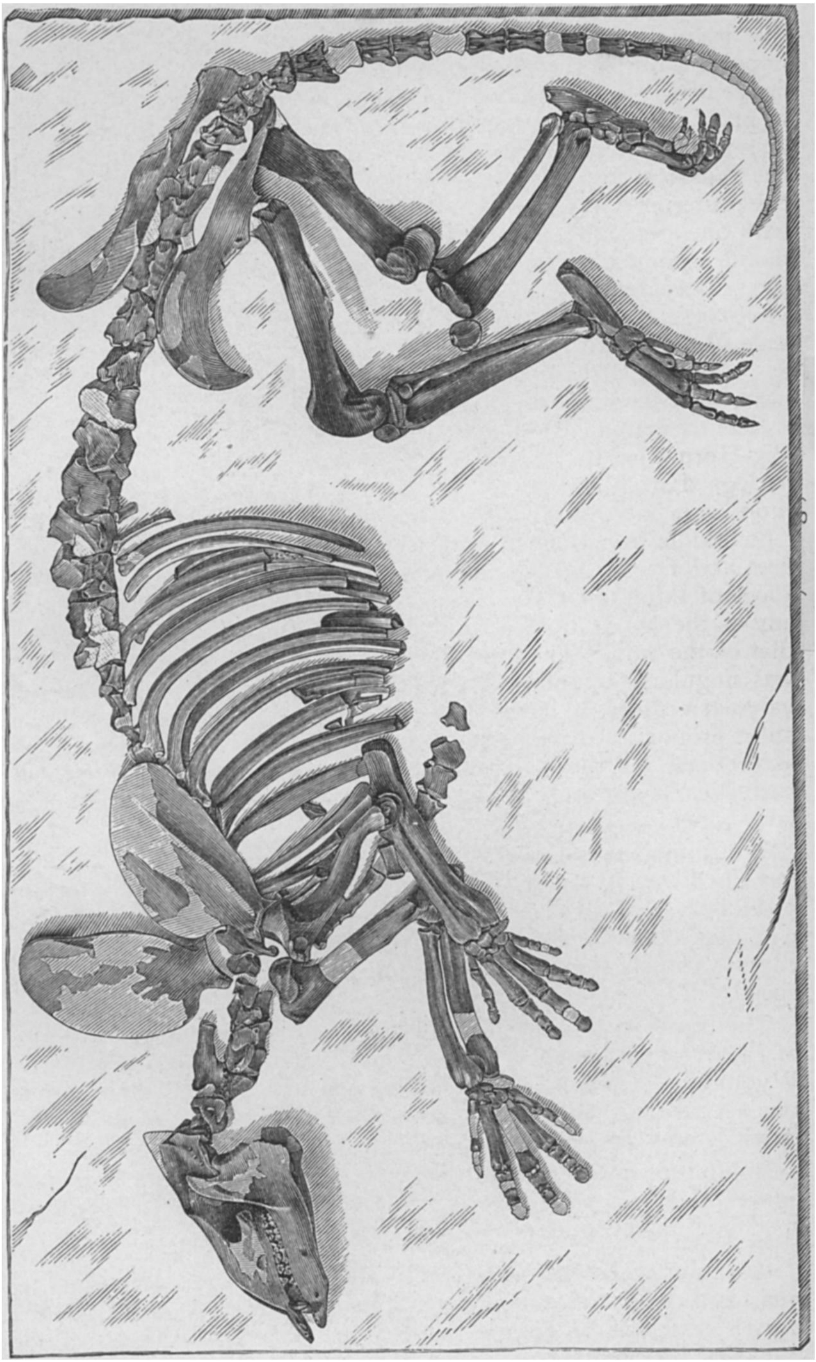
A circumstantial cause, so to speak, is the *extensive sand deposit* in which the water is found, and which by rising above the water becomes a great reservoir of confined air for the more compact deposits overlying its present free circulation in that direction.

If the barometer is steady for a few days, we may suppose this reservoir is charged with air of uniform density and exerting uniform pressure over the whole surface of the water, which is therefore free to take a level outline. Let the barometer fall rapidly and immediately there is less pressure upon the surface of the water in the well, while elsewhere it remains nearly the same. Hence the water is sucked up, as it were. The opposite would follow from the rising of the barometer. Moreover, a current of air would pass in or out the mouth of any well, with velocity varying according to the suddenness and amount of the change of barometer, and the extent of the reservoir for which that well serves as a vent. The phenomena reported are likely, therefore, to become less marked as the country settles up and the number of wells increases.

Numerous cases are detailed in *Nature* (Feb. 15th, '83,) where air issues from wells which have been sunk in sandstone or other porous rocks, also from delf-pits and cesspools. In some cases these have been made to blow whistles so as to indicate by sound the changes of the barometer. In a few cases reported, disturbances in the water of the wells were noted either of ebullition or variations of level. Mr. Strahan, who writes the article, seems to think it necessary to assume the existence of "fissures" or "caverns" in the adjacent sandstone to explain the movements of the water. Such may be true of the cases he considers, but cannot be of the Nebraska wells, unless the interstices of unconsolidated sand and gravel can be so designated.

Nearly three years ago I had a very instructive conversation with a Mr. Mackie, probably one of the gentlemen certifying to the facts under consideration, in which he kindly gave me many items observed by him in his extensive experience in that region as well-digger. Some of them, with others of my own observation, are the basis of my generalization above.—*J. E. Todd.*

PLATE XII.



Phenacodus primævus Cope, ONE-SEVENTH NATURAL SIZE

THE GENUS PHENACODUS.—This genus has been referred to in this journal at various times (see especially 1882, p. 522), as an important one in the phylogeny of the Ungulata. I give now a figure of the best preserved specimen of the genus, with the bones in place, as they were found by Mr. Wortman. The species is the *P. primævus* Cope. The specimen as it laid in the sandstone of the Wasatch formation, was divided by a gutter which scattered the posterior dorsal and lumbar vertebræ. These were all found, with one exception, and arranged in place. The head was also found separate a few inches distant. There are probably nine species of Phenacodus known. The largest of these is the *P. nuniënus;* next is the *P. primævus.* and then follow in order of size, *P. puercensis*, *P. vortmani*, *P. macropternus*, *P. brachypternus*, *P. calceolatus*, *P. zuniensis.* The last two and the *P. puercensis* are from the Puerco epoch, the others are from the Wasatch.

The measurements show that the *P. primævus* was as large as a Big-Horn; that its body was rather longer than in that animal, and its legs shorter and more robust. It was, in fact, proportioned more as in the common American tapir, but was of smaller size. The middle three toes of both feet reached the ground, while the first and fifth projected laterally and posteriorly, like the dew-claws of the hogs. The tail was longer and heavier than that of any of the living hoofed animals, resembling in its proportions that of the wolf. The eyes were small and the muzzle long, but was singularly soft above. Whether this soft part was pierced by valvular nostrils, as in the hippopotamus, or was produced into a short proboscis, as in the saiga or in the tapir, cannot be certainly ascertained, but there are indications of the insertion of important cartilages, if not muscles, on the superior faces of the premaxillary bones.

The animal was probably omnivorous in its diet. It was not furnished with any weapons of offense or defense pertaining to the osseous system, so that it must have sought refuge in flight. The well-developed muscular insertions of its limbs and the digitigrade character of its step, indicate that it may have had considerable speed.

The bones of this species have been found wherever the beds of the Wasatch epoch occur, but most abundantly in Northern Wyoming. From the Wind River valley Mr. Wortman brought two specimens, and ten from the Big-Horn basin. One of the latter is now figured.

In a future number of the NATURALIST I hope to give a similar figure of the *P. vortmani*, of which a nearly equally complete specimen has been found.—*E. D. Cope.*

GEOLOGICAL NOTES.—*General.*—The Marquis of Saporta, in a quarto, entitled "Apropos des Algues Fossiles," replies to Nathorst's criticisms as to the manufacture of vegetable forms from tracks of invertebrates, by acknowledging the latter's facts, while he rebuts the inferences, showing that though some markings may be questionable, others are undoubtedly impressions of plants.—— Professor Owen spoke upon generic characters in the order Sauropterygia, before the London Geological Society, December 20, 1882. Pliosaurus approaches nearer than Plesiosaurus to a generalized Saurian type, as the teeth have the pair of strong enamel ridges upon the opposite sides which occur also in the Crocodilia, and the large size of the head and shortness of the neck show an approach to the fresh-water Saurians. Polyptychodon exhibits a third modification of the type. Professor Owen omitted to notice the important work of Seeley on this group.

Silurian.—Dr. Lindström has published a treatise upon the Upper Silurian fossils of the north-eastern part of Sz-tshwan (China). These chiefly belong to well-known Silurian genera, but include Gomphophora, a coral with completely perforate walls and six short spinous septa in each corallite; Ceriaster, which resembles Columnaria, but has interior dissepiments and increases by intracalicular budding; and Platyphyllum, allied to Calceola in the form of the cup, and to Goniophyllum in interior structure.——Professor Winchell, in the tenth annual report of the Geological and Natural History Survey of Minnesota, refers the Keweenaw cupriferous red sandstones, shales and conglomerates; the light-colored horizontal sandstones of the south shore of Lake Superior in Wisconsin (with fucoids and Scolithus), and the St. Croix sandstone with its Lingulæ and trilobites, to the Lower Silurian.

Devonian.—In the *American Journal of Science* for February, Dr. H. S. Williams writes of a remarkable molluscan fauna at the base of the Chemung group, presenting much resemblance to that of the Kinderhook group. The facts point to a Kinderhook fauna, the center of which was mid-continental, and a typical Chemung fauna which had its center in the Appalachians. These blend at Ithaca, N. Y.——In the same journal J. M. Clarke describes three species of Dipterocaris, a fossil genus of crustacea from the Portage and Transition shales, and the lowest beds of the Chemung.

Cretaceous.—In a late number of the *American Journal of Science*, Mr. C. A. White gives some observations upon the molluscan fauna of the Laramie group. This fauna stands out distinct from that of any other geological formation, and to a large extent consists of brackish forms.

Tertiary.—Where was the geological editor of *Nature* when M. Garman's letter on the destruction of American Miocene mammals by "blizzards" came to hand? It is generally supposed that skeletons must be covered by sediment in order to become fossilized, which is not the case with animals overwhelmed by snow. And Mr. Garman's blizzard-killed cattle, where will their bones be next year? Not fossilized certainly. Fossil bones may be split by frost, but if the frost attacks them before they are fossilized, their chances of being preserved are small indeed!

Quaternary.—The remains of *Colymbus septentrionatis* Linn, have been discovered by E. T. Newton, in the Mundesley River bed, Norfolk, England.——The arguments respecting the Loess are still continued. Dr. A. Nehring, of Berlin, answers H. H. Howorth, in the February number of the *Geologicol Magazine.* He gives a list of the steppe animals found in the European Loess (Lagomys, Dipus, Spermophilus, Arctomys, Cricetus, Hystrix, Arvicola, Equus, Antilope), and asserts his belief that a considerable part of Germany or Central Europe once had a steppe fauna and flora. This fauna was interposed between the Arctic fauna of the glacial period, and the forest fauna of the Neolithic epoch. Postulating a fauna and flora like that of East Russia and West Siberia, Dr. Nehring maintains that the wind may have played an important part in the formation of the loess-like deposits of many places in Central Europe.——H. H. Howorth concludes his "Traces of a great Post-glacial flood" in the March number of the same magazine. The marine drift, in which littoral and deep-sea shells are often found confusedly heaped together, in some cases with little mixture of sand or shingle, and confined to small areas, unaccompanied by those sheets of silt which must have remained had subsidence been the cause of its formation, yields, in Mr. Howorth's belief, conclusive evidence of a great wave of waters, carrying the shells to varying heights and distances according to the conformation of the coast.

MINERALOGY.[1]

THE NOMENCLATURE OF METEORITES.—As a result of a careful study and classification of the 306 meteorites in the collection of the Museum of Natural History at Paris, Professors Daubrée and Meunier have introduced a large number of new names, which, however useful for classification, cannot be said to be a welcome addition to the already large nomenclature of lithology. The generic names, based on the amount of iron in the meteorites, appear to be well chosen, but the specific names are taken from the locality where the specimen chosen as a type happened to fall, and being without scientific import, will not receive general acceptance. By the valuable work of the authors, our knowledge of the origin and characters of meteorites has been greatly extended, but it can hardly be expected that lithologists will adopt all the names in the following classified list:

METEORITE.

I. HOLOSIDERITE.

Octibbehite, tazewellite, nelsonite, catarinite, braunite, caillite, schwetzite, jewellite, campbellite, burlingtonite, tuczonite, lenartite.

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[1] Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.